

Rockford, Winnebago Co., Ill.: the river froze over on the 21st; the ice broke up and moved out on the 26th and the river froze over again on the 28th.

Duluth Bay.—Duluth, Minn.: the bay froze over on the 25th; navigation closed on the 27th.

HIGH TIDES.

Chicamomico, N. C.: high tide occurred on the 2d, causing some damage to telegraph lines.

High tide also occurred at this station on the 30th; and at Duke, Fla., 30th.

ATMOSPHERIC ELECTRICITY.

AUORAS.

Auroras were observed during the month as follows: 8th, Cornish, Eastport, Gardiner, Kent's Hill, and Orono, Me.; Nashua, N. H.; Plattsburg Barracks, N. Y.; Burlington and Northfield, Vt. 9th, Cornish, Eastport, and Kent's Hill, Me.; North Truro, Mass. 12th and 13th, Kent's Hill, Me. 14th, Wytheville, Va. 15th, Nashua, N. H.; Variety Mills, Va. 17th, Fort Sully, Dak.; Orono, Me. 18th, Kent's Hill, Me. 19th, Bismarck and Webster, Dak.; Duluth, Moorhead, and Saint Vincent, Minn. 20th, Fort Sully and Webster, Dak. 21st, Fort Sully and Huron, Dak. 22d, Fort Sully, Dak.

THUNDER-STORMS.

Thunder-storms were reported as follows:

4th, Sacramento and Willows, Cal. 5th, Vashon, Wash. 8th, Key West, Fla.; Emporia, Fort Hays, Globe, Leavenworth, Lebo, Wakefield, Ninnescah, and Yates Centre, Kans.; Lamar and Springfield, Mo.; De Soto, Nebr. 9th, Butlerville, Sunman, and Vevay, Ind.; Fort Gibson, Ind. T.; Fort Madison and Keokuk, Iowa; Leavenworth, Kans.; Louisville, Ky.;

Fayette, Saint Louis, and Forest Park, Mo.; Cincinnati, College Hill, Columbus, and Yellow Springs, Ohio; Milan, Tenn. 10th, Albia, Iowa; Cleveland, Ohio. 11th, Albany and Yaquina Light House, Oregon; Corpus Christi, Tex.; Blakely, Fort Canby, Olympia, Port Angeles, and Pysht, Wash. 13th, Archer, Fla.; Moorhead, Minn. 14th, Titusville, Fla.; Dover, N. J.; Syracuse, N. Y.; Southport, N. C.; Stateburg, S. C.; Macon, and Lynchburg, Va. 15th, Lynchburg, Va. 18th, Archer and Cedar Keys, Fla.; Quitman, Ga. 19th, Archer, Fla.; Oskaloosa, Iowa; Wilmington, N. C.; Variety Mills, Va. 23d, Yuma, Ariz.; Lead Hill and Little Rock, Ark.; Cairo, Ill.; Corsicana, Palestine, and San Antonio, Tex. 24th, Utica, N. Y.; Fort Concho, Cleburne, and Abilene, Tex. 25th, Fort Niobrara, Nebr.; Cedar Hill, Tex. 26th, Lead Hill, Ark.; Jacksonville and Springfield, Ill.; Indianapolis, Ind.; Dubuque, Iowa; Frankford, Forest Park, and Springfield, Mo.; Fort Niobrara, Nebr.; Cedar Hill, Cleburne, Corsicana, Decatur, Mesquite, Palestine, and San Antonio, Tex. 27th, Cairo, Ill.; State College, Pa. 28th, Nashua, N. H., State College, Pa. 30th, Las Vegas, N. Mex.

MISCELLANEOUS PHENOMENA.

FOREST AND PRAIRIE FIRES.

Owing to the dry weather of November and previous months in the Mississippi, Missouri, and Ohio valleys, forest fires have been very prevalent, especially during November. The loss of much property has resulted, and at times navigation on rivers has been rendered dangerous on account of the prevalence of dense smoke. The following are some of the many reports which have reached this office concerning these fires:

Butlerville, Jennings Co., Ind.: extensive forest fires prevailed in this county from the 3d to the 8th, doing much damage to fences and timber.

Little Rock, Ark.: very extensive forest fires were raging throughout the state from the 5th to 7th, 12th to 15th, and from the 18th to 22d, causing much damage to crops and fences; the smoke was so dense that at times it was impossible to see objects one hundred yards distant.

Cairo, Ill.: dense smoke overspread this region during the 5th, caused by extensive fires in what is known as the "cypress swamps" in Missouri; the fires reached from Commerce, Mo., thirty-five miles north of Cairo, to New Madrid, seventy-five miles to the southward of this city. In the surrounding country the fires have spread rapidly through "Cashe" bottom until the greater part of its area has been swept by the flames. The smoke was so dense after 6 p. m. that the navigation on the rivers was partially suspended for a distance of forty miles along the Ohio River and for one hundred miles along the Mississippi River. Similar conditions prevailed on the 6th, 7th, and 8th; on the last date the fires reached what is known as the "Island," to the northeast of the city, and extended along the trestle of the Mobile and Ohio Railroad. On the 11th the forest fires were still burning in many places, though not so widespread as previously, rains having checked them somewhat, and the smoke did not interfere with navigation. On the 15th the fires again increased and light smoke prevailed during the entire day and night; on this date the transfer steamers were retarded in making their trips on account of smoke, and like conditions prevailed on the 16th, 17th, 18th, 21st, and 22d. The forest fires were extinguished by the snow on the 28th.

Bismarck, Dak.: extensive prairie fires were observed in the north on the 4th and 5th, and in the northeast and south on the 6th.

Fort Yates, Dak.: extensive prairie fires occurred to the west and northwest of station on the 5th, 6th, and 16th.

Fort Supply, Ind. T.: large prairie fires were raging south of this place on the 6th.

Valentine, Cherry Co., Nebr.: large prairie fires occurred about ten miles southwest of this place on the evening of the 6th.

Middlebrook, Randolph Co., W. Va.: the atmosphere was very smoky on the 7th, due to extensive forest fires which were burning about six miles west of this place.

Erie, Pa.: the forest fires in this section were extinguished by the rain of the 10th, on which date the air was filled with smoke from the smothered fires.

Memphis, Tenn.: during the 15th, 16th, and 17th the atmosphere was filled with dense smoke from forest fires in Arkansas; the rain of the 25th is reported to have subdued the fires.

Milan, Gibson Co., Tenn., 16th: the surrounding country has been enveloped in smoke since the 4th, caused by fires; farmers have sustained heavy losses.

Grand Haven, Mich.: several forest fires started east of this place on the 16th and made considerable progress; by the 18th the fires were burning fiercely over an area of about three miles, but the rain and snow on the 19th quenched the flames.

Shreveport, La.: extensive forest fires prevailed in Bossier parish, northeast of this city, on the 18th; reports from the burning district received on the 19th stated that several houses and barns had been destroyed.

Nashville, Tenn., 18th: destructive forest fires have prevailed in southwest Tennessee and Arkansas during the past five days, and on this date are still raging fiercely; many houses and much valuable stock and timber have been destroyed by the flames.

Louisville, Ky.: the atmosphere was filled with smoke during the 18th, caused by forest fires which were burning to the south of this city. On the morning of the 19th it was so dark as to render artificial light necessary.

Laconia, Harrison Co., Ind.: owing to forest fires in various localities and the high westerly winds on the 19th the smoke became so dense as to cause darkness to such a degree that it was difficult to see even a short distance, and steamers on the Ohio River were compelled to stop running at midday. Forest fires were of almost daily occurrence prior to the 23d, several houses, barns, fences, and much timber were burned; the rain which fell on the 23d soon checked the progress of the fires.

Lamar, Mo.: forest fires occurred on the 18th and 19th to the west of this place; the telegraph poles were burned, interrupting communication.

Oxford, Miss., 20th: the smoky condition of the atmosphere during the past few days was due to forest fires in western Tennessee and eastern Arkansas.

Fort Smith, Ark.: the atmosphere on the 21st was filled with smoke from extensive forest fires in the adjoining states.

Springfield, Mo., 22d: dense smoke has enveloped this section during the past few days, due to the extensive forest fires which have prevailed south of this city.

Lead Hill, Boone Co., Ark., 30th: dense smoke from forest fires filled the air on the 5th, 18th, 19th, 21st, 22d, and 23d; it is reported that several farm houses were burned and much other damage done by forest fires in various sections of the state.

Wauseon, Fulton Co., Ohio, 30th: the prairies about five miles southwest of here were on fire during the greater part of the month; forest fires prevailed about the 15th in the timber lands fifteen miles northeast of this place.

METEORS.

Meteors were observed as follows:

1st, Crete, Nebr. 2d, Cedar Rapids, Iowa. 3d, Cedar Rapids, Iowa; Woodstock, Md.; Utica, N. Y. 4th, Lead Hill, Ark.; Fort Maginnis, Mont. 5th, Vevay, Ind.; Cleburne, Tex. 6th, Boise City, Idaho; Nashua, N. H.; Clayton and Dover, N. J. 7th, Fort Sully, Dak.; Humphrey, N. Y. 8th, Fort Sully, Dak.; Utica, N. Y. 9th, Cedar Keys, Fla.; Cedar Rapids, Iowa. 10th, Lead Hill, Ark.; Fort Sully, Dak.; Cairo, Ill.; Woodstock, Md.; Crete, Nebr.; Stateburg, S. C.; Cleburne, Tex. 11th, Fort Sully, Dak.; Vevay, Ind.; Wakefield, Kans.; Wauseon, Ohio. 12th, Cedar Keys, Fla.; Savannah, Ga.; Wakefield, Kans.; Wauseon, Ohio. 13th, Fort Sully, Dak.; Wilson, Kans.; Biloxi, Miss.; Beverly, N. J. 14th, Lead Hill, Ark.; Fort Sully, Dak. 15th, Woodstock, Md.; Springfield, Mo. 16th, Yuma, Ariz.; Fort Sully, Dak.; Vevay, Ind.; Yates Centre, Kans.; Egg Harbor City, N. J.; Yaquina Light House, Oregon. 17th, Yuma, Ariz.; Vevay, Ind.; Dover and Egg Harbor City, N. J.; Quakertown, Pa.; New Ulm, Tex. 18th, Bar Harbor, Me.; Taunton, Mass.; Ardenia and Utica, N. Y. 19th, Moorhead, Minn.; Wakefield, Kans. 22d, Taunton, Mass.; Cedar Spring, S. C.; New Ulm, Tex. 25th, Savannah, Ga. 27th, Utica, N. Y. 29th and 30th, Humphrey, N. Y.

MIGRATION OF BIRDS.

Geese flying southward.—Red Bluff, Cal., 1st to 4th, 6th, 12th, 15th; Fort Sully, Dak., 3d; Fort Sill, Ind. T., 17th, 26th; Fort Madison, Iowa, 14th; Globe, Kans., 4th, 8th; Wellington, Kans., 4th; Yates Centre, Kans., 24th; Shreveport, La., 17th;

Somerset, Mass., 24th, 25th; Mottville, Mich., 13th, 14th; Forest Park, Mo., 24th; Brownville, Nebr., 27th; North Platte, Nebr., 4th; Manchester, N. H., 25th; Boyd's Corners, N. Y., 26th; Palermo, N. Y., 1st, 6th; Albany, Oregon, 5th, 13th, 14th; East Portland, Oregon, 16th; Linkville, Oregon, 1st, 2d, 7th to 16th, 20th, 23d, 24th to 29th; Roseburg, Oregon, 1st, 5th, 11th, 13th, 14th; Austin, Tenn., 13th; Corsicana and Fort Elliott, Tex., 4th; Palestine, Tex., 9th; Green Bay, Wis., 23d.

Geese flying northward.—Fort Madison, Iowa, 15th, 23d; North Platte, Nebr., 3d; East Portland, Oregon, 15th.

Ducks flying southward.—Duke, Fla., and Springfield, Mo., 29th; Green Bay, Wis., 25th.

MIRAGE.

Mirages occurred as follows: Yuma, Ariz., 6th, 8th; New London, Conn., 29th, 30th; Parkston, Dak., 11th, 16th, 21st; Webster, Dak., 11th, 15th, 27th; Cedar Keys, Fla., 10th, 11th; Marquette, Nebr., 1st, 3d, 10th to 12th, 28th; Galveston, Tex., 1st, 2d.

SAND STORMS.

Forest Park (near Saint Louis), Mo.: a severe sand storm prevailed all day of the 19th, the wind attained a maximum velocity of sixty miles per hour.

Sand storms also occurred as follows: Willcox, Ariz., and Keeler, Cal., 10th.

SUN SPOTS.

Mr. H. D. Govey, North Lewisburg, Champaign Co., Ohio, observed sun spots as follows: 5th, 6th, 12th to 17th.

VERIFICATIONS.

INDICATIONS FOR 33 HOURS IN ADVANCE.

The detailed comparison of the tri-daily indications for November, 1887, with the telegraphic reports for the succeeding thirty-three hours, shows the general average percentage of verifications to be 81.42. The percentages for the different elements are: Weather, 86.09; wind, 78.50; temperature, 76.31. By states, etc., the percentages are: For Maine, 80.30; New Hampshire, 78.90; Vermont, 78.00; Massachusetts, 80.57; Rhode Island, 81.10; Connecticut, 82.87; eastern New York, 84.00; western New York, 77.53; eastern Pennsylvania, 80.90; western Pennsylvania, 80.97; New Jersey, 80.77; Delaware, 80.73; Maryland, 84.23; District of Columbia, 80.70; Virginia, 83.77; North Carolina, 83.03; South Carolina, 82.87; Georgia, 83.93; eastern Florida, 81.87; western Florida, 78.20; Alabama, 81.50; Mississippi, 85.62; Louisiana, 82.85; eastern Texas, 81.35; Arkansas, 84.10; Tennessee, 84.03; Kentucky, 83.17; Ohio, 80.53; West Virginia, 83.97; Indiana, 82.17; Illinois, 82.43; lower Michigan, 74.00; upper Michigan, 75.78; Wisconsin, 80.14; *Minnesota, 70.67; Iowa, 82.00; Kansas, 85.57; Nebraska, 77.53; Missouri, 84.17; Colorado, 80.21; *eastern Dakota, 72.52; *southern California, 76.18; *northern California, 80.32; *Oregon, 70.80; *Washington, 70.83.

The predictions for all districts east of the Rocky Mountains, for November, 1887, were made by 1st Lieutenant H. H. C. Dunwoody, 4th Artillery, U. S. Army, Acting Signal Officer and Assistant, except those for Minnesota and eastern Dakota, which were made at Saint Paul, Minn., by 1st Lieutenant Thomas M. Woodruff, 5th Infantry, U. S. Army, Acting Signal Officer and Assistant, and those for the Pacific coast districts, were made at San Francisco, Cal., by 2d Lieutenant J. E. Maxfield, Signal Corps, Assistant; the verifications for all districts were determined by 1st Lieutenant Robert Craig, 4th Artillery, U. S. Army, Acting Signal Officer and Assistant.

CAUTIONARY SIGNALS.

Of the total number of cautionary and storm signals ordered

*In determining the general average percentage and the percentages for the different elements, Minnesota, eastern Dakota, and the Pacific coast states have not been included.

during November, 1887, it was practicable to determine the justification or failure of one hundred and nine; justified, eighty-nine, or 81.65 per cent. Of the above, seventy-six were ordered for cautionary signals; number justified, sixty-three, or 82.29 per cent. Thirty-three storm signals were ordered; number justified, twenty-six, or 78.79 per cent. Total number of direction signals ordered, ninety-four; justified, ninety-one, or 96.81 per cent. Number of signals ordered for easterly winds, eighteen; justified, seventeen, or 94.44 per cent. Number of signals ordered for westerly winds, seventy-six; justified, seventy-four, or 97.37 per cent. Number of storms without signals, eight. Number of signals ordered late, *i. e.*, after justifying velocity had begun, fourteen, or 12.84 per cent.

COLD-WAVE SIGNALS.

Total number of cold-wave signals ordered, one hundred and ninety-one; justified, one hundred and fifty-three, or 80.10 per cent. Eight cold-wave signals were ordered during the month by the Signal Service Officer at Saint Paul, Minn., of which, seven, or 87.50 per cent., were justified.

LOCAL VERIFICATIONS.

The following is from the report of the "Michigan State Weather Service" for November, 1887:

Weather and temperature signals are now displayed in one hundred and thirty-eight towns in the state, and on the baggage-cars of twenty-six trains on eight principal railroads of the state.

The percentage of verification of weather signals for November is as follows (the verification is taken from reports of displaymen furnished this office monthly): temperature, 82.2 per cent.; weather, 85.4 per cent.; temperature and weather, 83.8 per cent.

The percentage of verification of weather predictions for November on the D., G. H., and M. R'y., is 84.3 for weather and 86.7 for temperature; on the C. & G. T. R'y., weather, 79.8, and temperature, 76.3; P. H. & N. W. R'y., weather, 81.7, and temperature, 79.7; M. C. R'y., for weather, 80.3, and for temperature, 84.0; G. R. & I. R'y., weather, 80.0, and temperature, 77.7; C. & W. M. R'y., weather, 82.8, and temperature, 80.0.

The following is from the November, 1887, report of the "South Carolina Weather Service."

The percentage of the verification of the weather and temperature predictions for the state was: for weather, 85.2 per cent.; temperature, 89.4 per cent. per cent.